RESEARCH PLAN PROPOSAL

A STUDY ON HAND KNOTTED CARPET INDUSTRY OF JAIPUR CITY

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CHAPTER 1

Introduction

A carpet is a textile floor covering typically consisting of an upper layer of pile attached to a backing. It is used for the variety of purposes like protecting a person feet from cold and concrete floor, making a room more comfortable as a place to sit on the floor, reducing sound from walking and adding decoration or color to a room.

A term carpet is used inter-changeably with the term rug, although the carpet can be applied to the floor covering that covers an entire house and a rug is no bigger than a room.

The oldest specimen found of ancient weavings in the past was :

The oldest, single, surviving knotted carpet in existence is the Pazyryk carpet, excavated from a frozen tomb of Shiite chief in Pazyryk valley in Altai Mountains, Siberia.

Strong evidences collected from Middle East region say that carpet weaving was extensively carried out there during the 2^{nd} -3^{rd} B.C. The Pazyryk Carpet most likely came from Central Asia, though it is really a tossup between Persia or Armenia. Therefore it is termed as cradle of carpet weaving.

People migrated from Turkistan to West, the Caucasus, Persia, Anatolia to the east to China and then later to India, extended this art from the natives of these places. This complete range of locations is known as the Oriental Carpet Belt.

From 1930 to 1990, almost all carpets use synthetically dyed wool.

In the 1980s, an embargo against Iran diverts major exports to China, India and Tibet.

In the 1990s, there is a trend to use naturally dyed wool in hand-knotted Oriental rugs.

INDIA: Carpet weaving was introduced in 16^{th} century by Mughals (Akbar) in India. During this period he bought Persian craftsmen from their homeland and established them in India. He established carpet weavings centers at Agra, Delhi and Lahore to facilitate production of Persian styled carpets, which were inspired by designs of Kirman, Kashan, Esfahan, Heart and so on.

Indian carpets during Jahangir`s reign (1605-27) were more superior. Materials like silk and Pashmina were used that permitted greater number of knots to be included in the art works. Patterns of these Indian carpets resembled miniature paintings.

During Shahjahan`s reign (1628-58) the art of Indian carpets had reached new heights. Warps and wefts of fine silk yarns incorporated as many as 2,000 knots per square inch. Silk or pashmina piles gave the carpets a velvety like texture.

Initially the carpets produced showed the classical Persian style of fine knotting gradually it blended with Indian art and became famous as the demand for these spread abroad. The carpet industry flourished in northern part of the major centers found in Kashmir, Jaipur, Agra and Bhadohi.

Carpet industry in India has been successful in establishing social business models that helps under-privileged sections of society. Notable example of social entrepreneurship are Jaipur Rugs, Fab India.

Another category of Indian rugs which, though quite popular in most of the western countries, have not received much press, is hand woven rugs of Khairabad (Sitapur district). Flat weave is basic weaving technique of Sitapur, rugs and cotton is the main weaving material here but jute, rayon and chenille are also popular.

In year 2000, carpets were used in industrial and commercial establishments such as retail stores and hotels and private homes.

By 2010, a huge range of carpets were available at many price and quality levels ranging from inexpensive synthetic carpets to costly hand knotted wool rug was used by wealthy families. Wall to wall carpet is distinguished from rug or mats, which are loose-laid floor coverings as wall to wall carpet is fixed to the floor and covers a much larger area.

JAIPUR: The carpet industry in Jaipur started only in mid of 19th century when carpet making was introduced as a jail craft. Carpets initially, huge carpets were specially woven for royal residences. Inspired by the Mughals, prisoners were employed at looms, a tradition that has continued to date. Bikaner is still famous for its so-called jail carpets. Ajmer, and Bikaner are main centers for this craft in Rajasthan. Jaipur was another major center of the Mughal reign for carpet weaving. The rugs woven here copy the designs

found chiefly in the rugs of eastern and middle Persia. They nearly always present the cypress-tree, and also many animal forms, laid upon ground of dark red, blue or ivory white. The borders have a swaying-vine pattern, with the customary floral adjuncts.

Namdas' are carpets made of wool which are usually white in color. They are very soft and richly embroidered.

Another type of rug is ‘jajam'. ‘Jajams' are small carpets or mats meant for seating.

Carpets made of cotton are commonly known as ‘Durries'. These are the most popular in the category of carpets as they are easy to maintain and are liked by all.

Multi-colored carpets come in wide ranges of designs and patterns, which can go a long way in augmenting the beauty of your house. These carpets are available in various materials, sizes and styles.

Weaving is also done in small towns like Tonk, Chaksu, Manaharpura and Barmer.

In Jabalpur, Ahmedabad, Ellore, Poonah, Delhi, Bijapur, Madras and Jammu, all seats at one time of considerable rug manufacture, fabrics are still turned out, but they are not imported in any great number into this country. Velvet rugs from Benares, Patna and Murshidabad once had some fame. Tanjore, Warangal, Multan and Hyderabad all produced remarkable rugs under the old dispensation, but little or no trace of their industry remains.

Classification

An antique carpet is like a “living thing” – most of the antique forms of carpets and rugs that we see today reflect s the rich weave and designs of Persian styles.

Antique carpets: Carpets woven 100 years before (before1920) are categorized as Antiques. They are the traditionally woven carpets made with natural dyes or before introduction of the synthetic dyes (occurred during 1860-1870).

Semi-antique: Carpets those were woven around 1870 to early 20^{th} century.

Modern carpets: Carpets woven from 1920-1930 till today are known as modern carpets. These carpets are normally seen inspired from the western choices and demands.

The carpets woven before 17^{th} century are seen rare that they can only be seen in museum of large collections

Types of historical carpets

Indian Woolen Carpets – 5th century B.C.(traces were found)

Persian Knotted Carpets – Before 6th Century B.C.

Turkoman (Turkmenistan) Woven Carpets – Before 6th Century B.C.

Caucasian Woven Carpets – Before 6th Century B.C.

Chinese Felt Carpets – 8Th Century B.C.

Turkish Knotted Carpets – 12th Century B.C.

Mughal Indian Carpet – 16th Century B.C.

Types of carpets

There most common types with various styles optional with each respective construction type.

1. **Tufted**: the majority of carpet produced today is tufted. Tufting involves stitching face yarns into a backing material with multi needed machines. The fibers are secured to the pre-woven backing with a heavy latex coating. A secondary backing may be added for grater dimensional stability.

   Cut Pile: The carpet gets durability through the fiber used, the density of the tufts and the twists of yarn. There are 4 popular styles to choose from –

   Plush**:-** This has a smooth and even finish, providing a more formal look.

   Textured**:-** This style uses low density fibers of uneven heights. The resulting look hides dirt with an informal look, but it is not suited for high traffic areas.

   Saxony**: -** This has smooth and even finish but the fibers are longer than a textured plush and the fibers have a twist. Though this is the most popular style of carpet on the market, it has a tendency to show foot prints and other marks more than other carpets.

   Frieze**:-** This carpet style features long fibers with more twists, so the resulting

texture is informal. It hides foot prints and other marks easier than other carpets but is generally more suited for high traffic areas. If the pine are longer, it is called "Shag".

Loop Pile: In loop pile carpets do not cut yarn tips, making the loops visible. They are durable in construction and are considered all purpose carpets. There are various styles to choose from including level loop, patterned multi-level loop and cut and loop.

Level Loop or Berber**:-** This carpet style features packed short looped fibers. This provides a durable surface for high traffic areas with an informal appearance. Some color flecks in the fiber may make it easier to hide dirt, but the height of the fibers make seams more visible.

Patterned Multi-Level Loop**:-** This carpet style loops of varying heights to create a texture and or pattern.

Cut and Loop-**:** This carpet style is a mixture of cut pile and loop pile fibers. The variant makes for a textured appearance that is ideal for highly trafficked areas. As an added bonus, this type of carpet also hides dirt and stains

2. Woven carpets

These type of carpets are woven on big looms, more or less like any other fabric is woven. They may have cut and uncut piles and loops. Various colorful yarns are used for making a variety of patterns and designs on the carpets. As too much of labor and toil is required for making these woven carpets, they are generally very expensive.

Axminster: The pile of the carpet is inserted into the backing as it is woven and cut to length, creating u-shaped tufts that give a velvety surface. This process firmly lock in the fiber creating both a highly durable carpet and luxury finish. This traditional process allow for intricate designs and colours to be used providing great versatility.

Wilton: The production process of a Wilton carpet is very similar to that of the Axminster-the principle difference being that a continuous fiber is woven all the way through. The fibers can then be cut to create the range of cut and loop textured effect. This is the oldest method of carpet weaving and makes Wilton carpets unrivalled in quality, luxury and durability.

Hand-knotted: Weaving a hand-knotted rug requires a great deal of skill and often a lot of time to produce. The quality, and very often cost of a hand-knotted carpet is determined by the number of knots per square inch.

3. N**on-woven**

Non woven carpets are manufactured by a different process compared to Tufting and Weaving. Non woven carpets are made from Polypropylene Fibers. The fibers are formed into a web by Needle punching and then thermally bonded to form the carpet. They are the cheapest form of carpet and not very long lasting and hence they are used in applications where the need is short or not much traffic for an extended period of time. They are most commonly used for Automotive applications, for short period usages like exhibition hall sand foot-mats, etc. They are available in latex backed form,

for direct usage or non latex backed form for thermal forming applications

Others

Flat weave carpe:

This is created by interlocking warp and weft threads. Types of oriental flat woven carpet include kilim, soumak, plain weave, and tapestry weave. This is very popular in the oriental countries including Japan.

Needle felt carpet:

The needle felt carpet is a lot more technologically advanced. They are produced by electrostatic attraction of individual fibers that form a unique carpet which has an extreme high durability. Needle felt carpet will normally be found in the contract market for example hotels or places where there will be a lot of traffic.

Velvet carpet:

Velvet carpets are lightly twisted and offer a uniformed colour, they are very soft and this type of carpet is ideal for formal areas due to its luxurious appearance.

Hand Woven Carpet

Hand knotted carpets and rugs are counted as hand woven ones. However, hand woven floor coverings do carry a slight difference than knotted ones. Flat weaves lack a pile. They are woven a different kind of a loom and show a very meticulous affair of the weft

and warp. In addition, there are no knot rows. Flat weaves are seen woven in all over the world but with different names. They are known as kilim, soumak, jajim, palas, etc. Tapestries are woven flat and the weft is firmed down to cover down the warp entire

ly. Then there are various other diverse techniques of weaving flat weaves. For instance, the tent curtains woven by goat hair show some meticulous enmesh of threads flatly woven. There are many other forms of flat weaving techniques that are used on looms with three, four, six and eight shafts. The more the shafts, the more scope for surface texture on weft and warp & pattern. The weaving techniques range from simple twills, with all their deviations of broken weave and diaper, spot weave, shadow weave, block patterns, honeycomb and brocades.

Hand woven ones are made by yarn in almost all possible colors and shades. Flat woven ones are seen in seemingly bright shades and traditional patterns. Talking about carpets, they are as precious as any piece of valuable furniture. To maintain the [particular shade of your carpet, regular vacuuming and once-in-a-while washing can do wonders to you carpet or rug.

Hand-made carpets are traditionally more expensive than those made by machines. Though there are several carpet-making methods, including braiding, hand tying (or hand knotting), hooking, shearing and tufting, the most common of these are braiding and hand knotting.

Braided carpets are done by connecting or tying strips of fabrics together. Hand tying or hand-knotting are usually done on rugs. Countries that are known to produce beautifully crafted hand-knotted rugs include Spain, Portugal, India, Pakistan, Turkey, Afghanistan and Japan (among others). Hand-knotted rugs are descendants of Oriental Rugs and can be made in any shape, size, colour or design.

Knots

Asymmetrical (Persian or Senneh) Knot:

The asymmetrical knot is used in Iran, India, Turkey, Egypt and China. To form this knot, yarn is wrapped around one warp strand and then passed under the neighboring warp strand and brought back to the surface. With this type of knot a finer weave can be created.

Symmetrical (Turkish or Ghiorde) Knot:

The symmetrical knot is used in Turkey, the Caucasus and Iran by Turkish and Kurdish tribes. It is also used in some European rugs. To form this knot, yarn is passed over two neighboring warp strands. Each end of the yarn is then wrapped behind one warp and brought back to the surface in the middle of the two warps.

Jufti Knot:

The jufti knot can be seen in rugs of Khorasan, Iran. This knot can be either symmetrical or asymmetrical. The knot is usually tied over four warps making the weaving process faster.

Tibetan Knot:

In Tibet, a distinctive rug-weaving technique is used. A temporary rod which establishes the length of pile is put in front of the warp . A continuous yarn is looped around two warps and then once around the rod. When a row of loops is finished, then the loops are cut to construct the knots.

Knot density: Knot density is a traditional measure for quality of handmade carpets. It refers to the number of knots per unit of surface area - typically either per square inch or per square centimeter. Number of knots per unit area is directly proportional to the quality of carpet.

For two carpets of the same age, origin, condition and design, the one with the higher number of knots will be the more valuable. Knot density is normally measured in knots per square inch (KPSI) which is simply the number of vertical knots across one inch of carpet multiplied by the number of horizontal knots in the same area. Average knot density varies between region and design. A rug could have a knot density half that of another yet still be more valuable, KPSI is only one measurement of quality and value in Persian Carpets.

Hand-tying of knots is a very labour-intensive task. An average weaver can tie almost 10,000 knots per day. More difficult patterns with an above-average knot density can only be woven by a skilful weaver, thus increasing the production costs even more.

Upto 500 knots per sq.dm (30 per sq.in): very coarse

500-1000 knots per sq.dm (30 -60 per sq.in): coarse

1000-2000 knots per sq.dm (60-130 per sq.in): medium fine

2000-2500 knots per sq.dm (130-160 per sq.in): fine

2500-4500 knots per sq.dm (160-290 per sq.in): very fine

Over 4500 knots per sq.dm (290 per sq.in): extremely fine

Knot density Over 4500 knots per sq.dm (290 per sq.in) are rare in old and antique wool carpets.

Fiber type

The durability, look and feel and price of carpet are partially determined by the fiber used to make it. The most common fiber type are – nylon, olefin, polyester, acrylic, wool and blends.

Nylon

This is the most popular fiber type used for carpeting. There are two different types of nylon used to make carpets – nylon 6 and nylon 6.6. Nylon is present in roughly 60% of all carpets in the U.S.

Nylon is highly durable fiber, resistant to wear and tear. It is generally not a stain repelling fiber, though treatments are available to help protect it against staining. It is conductor of static electricity and when left in direct sunlight for long period of times, it fades.

Olefin

It is not as resilient as nylon, but it is less likely to fade. It is strong fiber that is resistant to wear and tear. This is an ideal fiber for any outdoor carpeting use because it is resistant to mold and mildew.

This is not comfortable carpet to walk on bare feet. The seams of the carpet fibers may be more visible than with other fiber.

Polyester

Polyester is increasing in popularity as it is a more cost effective option than other fibers. It is not suitable for highly trafficked areas because it is less resilient than nylon fiber and

is more likely to show damage and fade. If used with a thick cut-pile construction, it has a soft feel.

Acrylic

It is not a widely used fiber, but it provides the look and feel of the wool based carpets, without the expense. It is not the major conductor of state electricity and is resistant to mold and mildew.

Wool

Wool is the most costly fiber in carpet market today as it is only natural fiber used in carpet production. It feels good against bare feet and is highly durable. It is stain resistant but fades easily in direct sunlight.

Blends

Blends of these fibers are used to improve the overall quality of carpets in terms of look and feel and durability. The commonly used blends are wool and nylon.

Patterns

Pattern is just as much as integral part of the knotted carpet as colouring and both are elements of primary importance.

Pattern is also an integral part of the hand-made knotted carpet. Patterns like flowers, arabesques, rhomboids and occasional animal design were common produced and employed as design with varying degree of stylization. Each of these designs has a unique meaning. For example, the circle, zigzag and tree signified eternity, light and happiness respectively. Later, Persian style was amalgamated with Indian design giving rise to Indo-Islamic carpet.

Cypress tree:	Survival in the afterlife.
Tree of Life:	Eternal Life.
Anar:	Pomegranate riches in abundance.
Camels:	Wealth and happiness.
Peacock:	The scared bird.
Dove:	Peace and good Omen.
Comb:	Cleanness, Sometimes the pillar of faith (On which Islam rests).

Hour Glass:	A reminder that time runs out for all and that there is no escape.
Cloud Bands**:**	Good Fortune.
Ross:	In is devoid of religious significance and is purely ornamental.
Weeping willow:	Death, Sorrow, Grief.
Cock:	The devil, woven into carpet to protect the owner or user from evil eye.
Lions :	Victory and Glory.
Dogs:	To protect the owner or user from theft.

In order to understand the present state of the carpet-making industry in the East, it must be remembered that for 2,500 years the only patterns reproduced in varying degree of stylization, were those of flowers, arabesques and rhomboids, with an occasional animal design. These patters have never become outmoded, while designs of modern or Western inspiration have not succeeded in establishing themselves.

The majority of oriental motifs have a profound meaning:

The circle signifies eternity,

The zigzag water and light,

The swastika a light showing the way in darkness,

The meander the continuity of life and

The tree of happiness or goodness.

A traditional pattern is usually composed of a choice of motifs from among roses, lotus, poppies, myrtle, henna, crocus, narcissus, lilies, the tree-of-life and variety of birds. Instead of designs of 16th and 17th century, Indian examples and early Indian textile, the country has succeeded in making an impact upon traditional patterns. While Persian weavers prefer to depict animals such as lions and tigers, Indian weavers would rather represent birds. The way of depicting flowers of Indian style and Persian style was also different.

Techniques

The usual procedure adopted by a carpet-designer is as follows: having drawn up his design, he transfers it to graph paper on which each square represents a single knot. Then

he divides the paper into varying sizes, depending on whether the pattern is intended for the central medallion or for a part of a repeat pattern.

Symbolism of Colours

White:	The colour of mourning, death and grief (India, Persia and China). Also symbolic of peace and purity.
Black:	Revolt, Destruction (Islam).
Red:	Joy, Happiness, Wealth (Islam).
Yellow:	Imperial Colour.
Orange:	Devotion, Faithfulness or Piety (Islam).
Gold:	Power, Wealth (Islam and Persia).
Brown:	Fertility, Agricultural abundance (Islam).
Light Blue:	Power, Symbolic of Heaven (Persia).
Dark Blue:	The heavenly colour and also colour of morning.

Changes in style of a particular type of rug can be helpful when you are trying to date it. For example, it's extremely rare for a late-eighteenth century or early-nineteenth century Isfahan to have been woven on a foundation of any material other than cotton and to have knot above **400 per square inch.**

On the other hand**,** the fine modern Isfahans are almost always woven on a silk warp and weft and their average knot counts are considerably higher.

Rugs woven in Hamadan region also show a change of style. In the old days, in the villages of this area, the Persian weavers frequently made rugs with camel color backgrounds. Modern day Hamadans seem to use every color under the sun, expect camel.

The softly multicolored, glowing Moutesan Kashan rugs are no longer made. These days, Kashans are made in traditional style, including the white ones.

When a rug is made of silk, no matter from which country it originates, if it's antique the silk will be of a high quality. Carpets woven from straight forward cotton always have matted look if they are antique.

If the rug is an Turkish (Anatolian) and want to know whether it's antique, look at the weft threads**.** If these turn out to be red, that an important hint: Most of the antique Turkish have red weft threads, and their weave tends to be rather coarse(less than 100 KPSI).Coarse knotting (even as low as 40 KPSI) is also typical of antique woven Chinese pieces

In this case the coarser the weave, the older the rug is a very general rule.

Process

The process that creates a hand-made/hand-knotted carpet can be explained as under:

Wool sorting & Washing:

Wool is either imported or is bought from nearby markets and is carefully sorted to pick out unwanted particles. Wool often carries dust, grease which is removed by washing it thoroughly and is then sun dried for two-three days.

The Tibetan wool has a strong good fiber length is imported in scoured form, good luster and a high resilient value. The New Zealand wool is of 36 micron, 100 mm barb length and is identified as type 128. British wool meeting regulatory standards have also started being available in the market.

Carding:

The carding process allows the fiber stand to flow smoothly when spinning. This is also the stage for blending different wools and to ascertain the ratio of different origins. Traditionally, carding was performed by hand and machine carding was introduced when the industry grew. However hand carded product is still available if a customer so desires.

Spinning:

The carded wool is spun into yarn by using a charkha or a spinning wheel. The thickness of the yarn depends on the quality of the carpet and generally a 3 ply yarn is used.

Dyeing:

The traditional pot dyeing method has been largely replaced by machine dyeing in closed Chambers. Dyes containing harmful substances such as AZO are banned and dye-stuffs from renowned international manufacturers are used. These dyes have a high degree of fastness. Depending on the weather, the dyed yarn has to be dried in the sunlight for one

to three days. Pot dyeing and vegetable (natural) dyeing are still being used by some manufacturers.

Carpet Knotting:

Knotting is an art. Weavers who weave on a regular basis have a very good speed in knotting. They tend to develop this speed over a span of time. One or more weavers work on a loom depending on the size of the carpet. Each weaver makes individual knots row after row. The designs are chartered out on a graph and a map reader or another weaver instructs the graphic designs to the ones knotting the carpet. The dyed yarn is made into balls and scissors, iron rod, levers, comb beaters are used as tools.

Trimming:

The finished carpet is taken off from the loom and the designs & patterns are trimmed by scissors.

Washing and Drying:

The trimmed carpet is washed with the fresh water & chemicals. The washed carpet is

dried in the sunlight up to four or five days.

Final Touches:

The dried carpets are given final touches by re-trimming and stretching, where ever necessary. The purpose is to bring the fabric woven in level at the surface.

Packing:

All washed carpets are rolled and wrapped in polythene sheet and is sealed at each end. Again, it is wrapped in Hessian cloth and sewn. Generally, around 14m2 are packed in each bale.

Determining carpet quality

Carpet quality is determined by a variety of factors including the weight, fiber type, fiber construction and density.

There is no universal system for grading of carpets. The grades designed to carpet by the manufacturer are generally used as marketing tool.

Weight

The weight of carpet is important as it shows how any fibers are present. The more fibers the heavier the carpet, The better. The face weight of the carpet is usually provided when selecting the right carpet for a home or business.

Materials

The common materials used for weaving carpets are wool**,** cotton and silk. Wool has always been the basic materials of the knotted carpets. Sheep wool, lamb's wool camel and yak hair also sometimes used, depending on the centre of manufacturing of the carpets. Silk has been used for weaving some of the finest and lightest of carpets. "In Kashmir silk is commonly used not only for the pile but also for the wrap and weft, particularly in the case of a high quality piece" (Ruedin 1984). "Cotton is grown and hand spun in India and Persia, and in fact most of the countries which make hand knotted carpets" (Bamborough 1979).

Export

Indian handmade carpet industry employs over 1 million people is one of the biggest industries in the world, offering a wide range in terms of designs quality, techniques and prices. No wonder the country boasts of number one position on the global carpet trade with a share of around 35% in the world trade. During FY 2012-13, the industry earned USD 1.07 Billion by way of exports.

With constantly rising demand from emerging markets like Africa, China and Latin America, India's carpet exports have increased by 10.23% during the first half of FY 2013-14 as per data released by Carpet Export Promotion Council (CEOC). The exported USD 530 Million worth of carpets and floor coverings during the period of April to September 2013. In September2013 alone India's Carpet exports were valued at USD 73.5 Million, indicating a 5% increase over the export worth USD 69.98 million during the corresponding month last year.

Export of handmade woolen tufted carpets grew by 4.9% during September 2013, while handmade synthetic carpets hand handmade silk carpets posted a growth of 5% and 23%, respectively.

India exported carpets worth USD 808 million during the last fiscal year, registering a 19% growth compared to 2010-11.

Carpet exports touched $1,173.4 million (Rs, 7,771 Crore) in April-February and are expected to grow 9% in 2014-15 from a year before.

Ergonomics

Ergonomics is the scientific study of people at work. The goal of ergonomics is to reduce stress and eliminate injuries and disorders associated with the overuse of muscles, bad posture, and repeated tasks. This is accomplished by designing tasks, work spaces, controls, displays, tools, lighting, and equipment to fit the employee´s physical capabilities and limitations.

Why interventions? The purpose of an intervention study in the workplace is to demonstrate that changes in the workplace can have an effect on health outcomes. Since Musculoskeletal (MSDs) are a major source of reports of ill health, work absence and disability with consequent costs to the economy, it is almost axiomatic that interventions that can be shown to prevent such problems are desirable in a civilized society.

Rationale of the study

Indian carpets are renowned all over the world since the early 16th century. Over the period various clusters have emerged in the northern part of India, and because of few reasons like historical importance, availability of resources, influence of exotic art culture Bikaner, Agra and Jaipur have emerged as major centers for carpet manufacturing. The carpets from these areas are mainly exported. As a result these areas are earning much foreign exchange and giving employment to masses.

There are some problems faced by new players in this field are:

- Quality of carpets (in terms of knots).
- Proper channels are not available for marketing.
- Low purchasing power for local players.
- Not too attractive colour combination
- Non-skilled labour.
- Lack of awareness.
- Downfall of market.
- Physical problems of artisans affecting the production.
- Environmental conditions of weavers.

This study will help overcoming these problems by analyzing and providing the solution after studying the strength, weakness, opportunities and threats for carpets weaving and changing trends. This study will prove useful for new businessmen in this field and the existing ones too.

Objectives:

The Objective of the study are:

- To document the changes in designs, tools and techniques and manufacturing process of carpets in last fifty years.
- To identify various musculoskeletal disorder and occupational health problems amongst the artisans.
- To provide ergonomics intervention program for improvement in occupational health and productivity and to analyze the data through paired t-test
- To study the changes that have occurred in export in last fifty years.

Limitations:

- The study will be limited to city of Jaipur and manufacturers of carpets in Jaipur.
- Number of firms visited will be 20.
- Number of managers will be interviewed 20,
- Number of artisans will be interviewed (20 firms x 3 units =60 units)

  60 units x 5 artisans = 300 artisans

CHAPTER 2

Review of literature

Motamedzade. et al (2007) has pointed out the impact of ergonomically designed work stations on shoulder EMG activity during weaving work related musculoskeletal disorder (WMSDs) are common among carpet weavers specially in shoulder region that result in reduce job performance ,productivity and increase time of work. Weavers are exposed to many of the recognized risk factors for musculoskeletal disorder of the shoulder, including repetitive tasks, lack of work-rest regime, long duration awkward arm stooped postures and awkward shoulder postures/motions.

Shin&Yoo(2015) Effect of workstation height and distance on upper extremity muscle activity during repetitive below-the-knee assembly work Workers should engage in below-the-knee work close to their bodies, since distance appears to be a stronger risk factor for injury than height above the floor.

Babel and Chaudhary (2010) pointed out in their study that like other centers for carpet manufacturing in India, Jaipur carpet industry holds a eminent place in enriching the nation's heritage, meeting the economy's need for foreign exchange providing employment to ration expanding work force. But the prime prerequisite to bolster and substantiate the position of Indian carpet with quality of carpets is to innovate designs which are a blend of traditional layout complementing Persian style which till date is popular in hand knotted carpet.

Rezaie (2011) quoted that To be fair, both the government of Afghanistan and the Afghan traders and producers of hand-woven carpet are to blame for the declining production and an industry that is in ruin. The government of Afghanistan needs to step up its efforts manifold to help Afghan traders find direct access to foreign markets. On the other hand and more important, it is the Afghan traders and businessmen themselves who need to learn how to graduate their traditional businesses into modern and viable "export houses" that are able to compete with those in Pakistan and elsewhere

Khan & Mishra(2012) suggested in their studies that as carpet industry is going through major changes, traditional markets are saturated while new markets is having opportunities for growth through the adaption of the changes. However some re-engineering measures through government intervention like CAD, product mapping, income tax relief, duty exemption, vat exemption, control over cost of new raw material through subsidy, export promotion etc. may be helpful in efficient and effective growth of the carpet industry.

Zardeini & Aghdaie (2012) studied about the SWOT analysis of Persian handmade carpet and found unsound competition of some competitors has had a negative impact or Persian handmade carpet export. Tailored use of opportunities in environment can provide condition of carpets production and exporting with low cost. In addition it can help improve the level of Persian carpet in global markets. Access to expert and skilled worker and use desirable wool and natural color lead the ability of production beautiful and desirable carpets.

Tyagi (2012) worked on socially responses practices of carpet ,in case study of Jaipur rugs. She pointed out that this company connects the grass root level weavers with global market (like USA)while providing them steady income. Jaipur Rugs management recognizes the importance of international quality standards, issues related to deployment of child labour special in such a model where the firm does not have direct control. She concluded that the coordination of activities across multiple legal entities bestow Jaipur Rugs with access ,but not ownership to specific skills , influence but not control, over key process and decentralization at investment and production helps in converting its fixed cost.

Bakshi and Day (2012) pointed out in their study and concluded that weavers are aware of health ailments which they and other weavers face. But the adverse impact which these ailments can have on their health and life in the long run needs to be shared with them in an articulate manner. Camps in association with government doctors at block level can be conducted to bring awareness, free health check up of the weavers and steps to be taken by the weavers to prevent health ailments. Weavers should be made aware on new technology (modern loom) citing the benefits in comparison to existing looms. The government has taken initiatives to promote handmade carpet weaving and Indian

Institute of Carpet Technology runs training centers in the Kashmir valley for training weavers on the modern looms. One such center has been running in Nowgam. The weavers should be made aware on all such initiatives as they still are at a distance from all the programs and schemes.

Kane (2012) pointed out in her study about the storage and the conservation of antique carpets in city palace Jaipur. She noted that there is not enough money or perhaps sustained attentio , to truly care for the collection to the degree that it requires or deserves.

Choudhry& Shash (2012) wrote about the latest devices and machines used in hand made carpets manufacturing and associated featured the used of modern machines and devices will reduce the production cost. At the same time the safe working environment of the craft persons should be improved using ergonomic principles where ever it is possible to do without significant increase in the cost as the handmade carpet industries has to compete with machine made carpets.

Rezaian (2013) depicted in his study that the vast bazaar in the Iranian capital Tehran is home to, by most estimates, the highest concentration of handmade rugs in the world, with millions piled high in more than a thousand shops in a labyrinth of ancient passage ways. Iran's rug exports, however, are declining – revenue was down 17 per cent last year – as are the number of people employed in the industry. Many associated with the trade believe its survival is threatened. The centuries-old industry has been hit hard by repeated economic crises in recent years, as well as by sanctions imposed by the United States, formerly the biggest market for Persian carpets. Iranian carpet experts are calling on the government to boost the image of the hand-woven rugs in countries other than the US.

Karolia & Sardiwal (2014) revealed in their study that Namda Industry as well as people involved is in deplorable conditions. Although it is a traditional craft but in a declining trend. With appropriate kind of intervention and support a turn around can brought to the industry as well as the people.

Soni&Dr.Nath (2015) in their study gave an overview of major issues related to Carpet. It is clear that Indian Carpet Industry plays an important role in India's total exports. But there are various challenges which are being faced by this industry. Lack of innovation, outdated technology, low profitability, unskilled and uneducated workers, labour law issues and lack of infrastructural facilities in the carpet belt are major barriers that make

this industry less competent as compared to carpet industry in other exporting countries. In order to improve the status of this industry it is very important to removes the obstacles.

Pandey (2015) stated that carpet industries has been growing like other handicraft industries in the country. It has some challenges like raw material, finance, lack of technical intervention etc but at the same time it gives employment to illiterate people at the door steps and stop them from migration. It also plays a vital in bringing foreign currency to our country. Recent initiative of government of India and USA for introducing single window trading system for product trading between two country will boost Indian carpet industries .The challenges being faced by the industries may be converted in to opportunities by producing the skilled artisans, technology interventions, to meet out the requirements of carpet manufacturing.

Bano (2015) found in her study that the increasing growth in terms of value of export indicates the high potential of sustainability of industry in coming future .this industry has the capacity to employee the million of rural unemployed artisans. It is a curbing agent of removing the regional disparity from the country. It prove much helpful in poverty elevation by giving the means of earning to the million of population of backward region.

Jahan.& Dr. Mohan(2015) point out in their study that government needs to co-operate on more effective basis with NGO's to eliminate child labour from industry otherwise too the feature potential of handicrafts and hand knotted carpets are immense better infrastructure leads to better productivity. It is not just the source of earning but also it provides the creative satisfaction.

Sain & Meena(2016) has talked about SSIs role in their study. They pointed out that the small scale industries (SSIs) play very important role in the Indian economy. SSIs contribute in terms of industrial production, export, employment and creation of an entrepreneurial base for the country. In most of the SSIs in India, either traditionally designed tools are used or manual work is performed. Long hours work with traditionally designed tools and un-ergonomic work places can cause musculoskeletal disorders (MSDs) and other occupational health problems among workers.

Choobinehet al (2016) has mentioned in their study that the occupational health and safety in the sectors and improving working conditions undoubtedly have considerable impact on the national economy and quality people's life. The traditional approach to occupational health has tended to concentrate mostly on factory and mine workers in the urban industrial settings and has neglected occupationally related health problems in informal or unregulated sectors when the majority of many developing countries population live and work.

Statements in interviews

Kataria(2013) Vice-Chairman, CEPC in an said that carpet export markets is continuously facing lot of problems due to severe recession in the International Markets for last around 4 years. Truly speaking export market of Hand-knotted Carpets is continuing deterioration beyond expectation. Non-availability of skilled labour is a big problem for the industry men in India. The labour have other job opportunities in many more industries as there they are able to get better wages. He disclosed that presently situation of labour problem in Jaipur has reached to a severe scarcity even of fresher. With a heavy heart he said that he is unable to forecast the future of Handmade Carpet Industry of India after 5 years. He further said that due to lack of good orders from Overseas Buyers, the Exporters are not able to make use of strength of US $. Moreover, since US $ rate is quite uncertain and production cycle of qualitative Carpets is very long, they are unable to make use of prevalent Forex benefits. He added having informed the Minister that the Carpet Exporters have received letters from the Customs Dept. that the Handmade Carpets which are not square or rectangular in dimension should be accounted for through $r^2\cap$formula which is not possible for carpet export trade because the weavers nor the Overseas Customers are mathematically so qualified to understand the ^{2} formula. Moreover, the size measurement system of carpets in India is prevalent since centuries and calculation in the ongoing Ft2/M2 system is quite acceptable to all concerned and it should not be changed. The delegation has invited the attention of Minister about the production cycle for all high quality carpets which is quite long. The banks therefore, should be directed to allow a period of 360 days instead 180 days for post shipment bills for all high quality Carpets. The delegation also brought this fact to the knowledge of the Minister that few countries impose very high rate of Import Duty on Handmade Carpets when exported from India directly. While, for Chinese Carpets, it is much lower and

consequently the Indian Exporters are facing severe problem in exporting them directly. . He added that in a meeting with CEPC in recent past at Bhadohi, Chairman, ECGC refused to accept the exporter's allegation that his officers don't care for the problems of the exporters although the fact remains that most of the exporters are big sufferers of ECGC.

Singh(2013). The India Carpet Expo is the world acclaimed established exhibition of Handmade Carpets and other floor coverings in South East Asia. 285 exhibitors from U.P., Rajasthan, J&K, Panipat, and Delhi etc. displayed their latest designs of Handmade Carpets and other floor coverings. Dr. Saumitra Chaudhari was impressed with the display of various ranges of Handmade Carpets from the higher quality to lower quality and appreciated the adaptability of the industry in providing products from traditional to modern designs, according to the need and requirement of the end consumers. Dr. Chaudhari was hopeful that with the removal of 2% Excise Duty on Handmade Carpet, the benefit will reach to the small exporters and now they can compete in the international market. 350 overseas buyers from more than 50 countries including USA, Germany, France, Italy, U.K., Turkey, Brazil, China, Canada, Denmark, Japan, Korea etc. confirmed their visit to the fair to generate business for this rural based cottage industry. On the first day of the Fair 150 Buyers registered their presence.

Mirza(2013) Vice Chairman CEPC, in an interview said that duty on Silk Yarn has increased tremendously. Chinese Silk which he used to buy at INR 280 per kg. around 1982 is now available @ INR 1800 per kg. Weaving wages for small sizes 18/18 Pure Silk Kashmir Carpets which in recent past used to be INR 1800-1900 per sq. ft., due to shortage of weavers has been increased to INR 2800-3000 per sq. ft. and due to such an increase in the weaving charges and consequent enhancement of prices of Silk Carpets in their sale by Overseas Customers has become risky with decrease in their turnover. He disclosed, although it is surprising but true that few of his good Silk Carpets could be sold by him only now after around 4 years. M. D. Mirza in reply to a question said that increase in the prices of Silken Yarn is due to Government's shortsighted policy of allowing export of Cocoon Waste as the same is the basic raw material of Silk Yarn for Kashmiri Carpets. He opined that Government. of India in the interest of Kashmiri Silk Carpet should promptly make changes in its export policy in this regard and stop the export of Cocoon Waste with immediate effect. In addition, the Government should forthwith start giving some reasonable subsidy on Silken Yarn meant for Kashmir Silk

Carpets. It is unfortunate, he added that good number of Silk Manufacturing Mills supplying silken yarn for Kashmir Carpets have been closed due to acute shortage of Cocoon and consequently silken yarn have become very expensive. He disclosed that China too is making Silk Carpets of similar varieties and qualities of Kashmir Carpets but for reasons detailed above India is not able to compete with Silk Carpets from Iran and China. Moreover, weaving of Art Silk Carpets have decreased considerably. For those reasons also due to less buying capacity of end consumers in the buying countries due to global recession, export of Kashmir Silk Carpets is on decreasing trend According to him there are around 1000 outlets for retail sale of Kashmir Carpets in India but their turnover have gone down, meaning thereby that Kashmir Carpets are being sold at loss in sq. mtr. At the moment, according to him, nobody in Kashmir now prefers to manufacture Woolen Carpets.

Khawaja (2015) LAHORE (APP): Pakistan Carpet Manufacturers & Exporters Association (PCMEA) has sought relief from the government to revive carpet industry as this would also benefit five million unemployed labour in the country. Pakistan carpet exports have witnessed a steep decline of 58 per cent during last six years as hand-made carpet exports has reduced to $ 120 million from $ 258 million, rendering about 5 million people jobless, he added.

Talking to this scribe, he said acute shortage of power, dearth of skilled labour force and high mark-up rate were main factors behind sharp decline in carpet exports.

Books and newspapers

Nepali times Issue #557 (2011) : If the government stepped in to save the carpet industry, it still has a great potential for growth. The Made in Nepal brand is strong and the added "Tibetan" label gives Nepali rugs an edge that could translate into premium prices.

But carpet traders say the lack of incentives for an industry that has the potential to create tens of thousands of jobs is keeping it hamstrung. Successive governments since the mid-1990s have been interested only in extracting either taxes or bribes from the industry. The government also has an important role in depoliticizing union activity, and the

competition between politically-affiliated unions that have wrecked the industry, they add.

CHAPTER 3

METHODOLOGY

Research methodology is an organized way to resolve and explore any research problem. It can be called the systematic, theoretical analysis of the methods applied to a field of study.

Pilot study

A preliminary survey was done by visiting 5 carpet manufacturing firms to prepare the base of the study so that the questionnaire and interview schedule could be prepared. It created the base of the study enabling the researcher to become conversant towards the carpet industry.

The detailed plan of work is as follows:

Phase 1:

- Document the changes in designs, tools and techniques and manufacturing process of carpets in last fifty years.

Data collection sources: Personal visits, Books, Library, Internet (Secondary Data and Primary Data).

Primary data: The primary data will be collected using open-ended questionnaire, and interview schedule on which the respondent will be asked to reveal their perception and experiences.

Secondary data: The secondary data from different relevant sources such as in company literature, web sites of the company, reports & records, journal books and the web will be used to analyze the current situation

Locale of the study: The locale of the study will be Jaipur City. The research will be conducted for 20 Firms in Jaipur City who deals with the manufacturing of carpets.

Each firm have3 units –

- Manufacturing unit
- Finishing unit
- Washing unit

That is 20 Firms x3 units = 60 units.

Selection of sample:

The data will be collected through convenient sampling. The firms which have yearly turnover of minimum 15-20 crore will only be included for sampling. 60 units will be selected to explore profile of artisans, the tools and techniques, working condition and health problems faced by the artisans. The artisans who have work experience of 10-12 years, and belong to age group 25-60 years will be approached for the interview. Five artisans from each unit will be selected.

Sample size:

Sample size is 20 carpet manufacturing firms, each of them contains three units that is manufacturing unit, finishing unit and washing unit will be explored.
Five artisan from each unit that is 60x5=300 artisans will be interviewed.
One manager from each firm that is total 20 managers will be interviewed.

Interview Schedule

Interview will be scheduled on following points for artisans to know about the tools and techniques for the manufacturing the carpets and to study the health hazards and problems of artisans by visiting the work place of artisans.

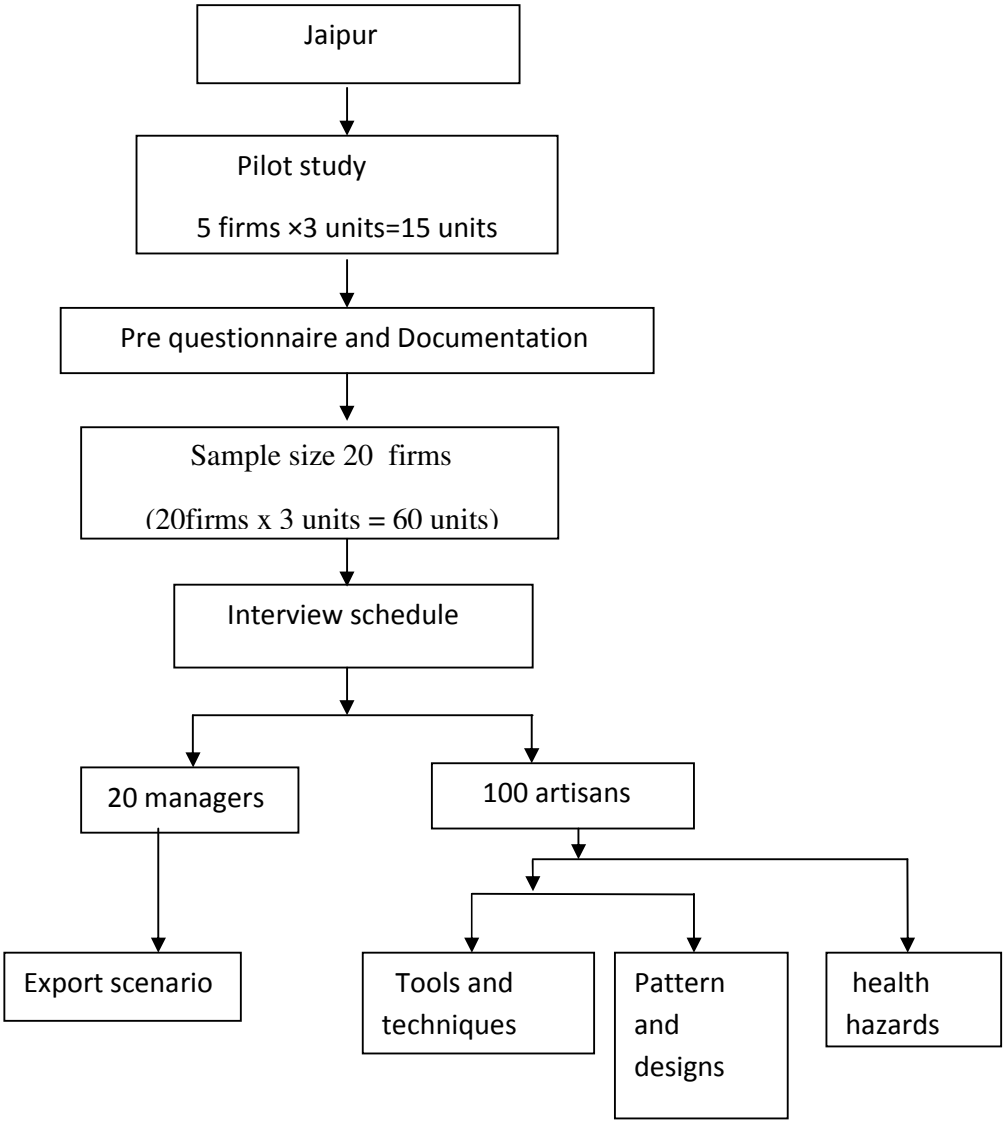
- Demographic profile,
- Manufacturing process,
- Tools and techniques,
- Changes and patterns,

Interview will be scheduled on following points for managers`-

- Organizational setup,
- Product produced in units,
- Firm annual turnover,
- Scale of carpet unit,
- Problems faced by managers,

- Health hazards of artisans,
- Factors affecting production.

Phase 1



Pictorial presentation for tools and techniques

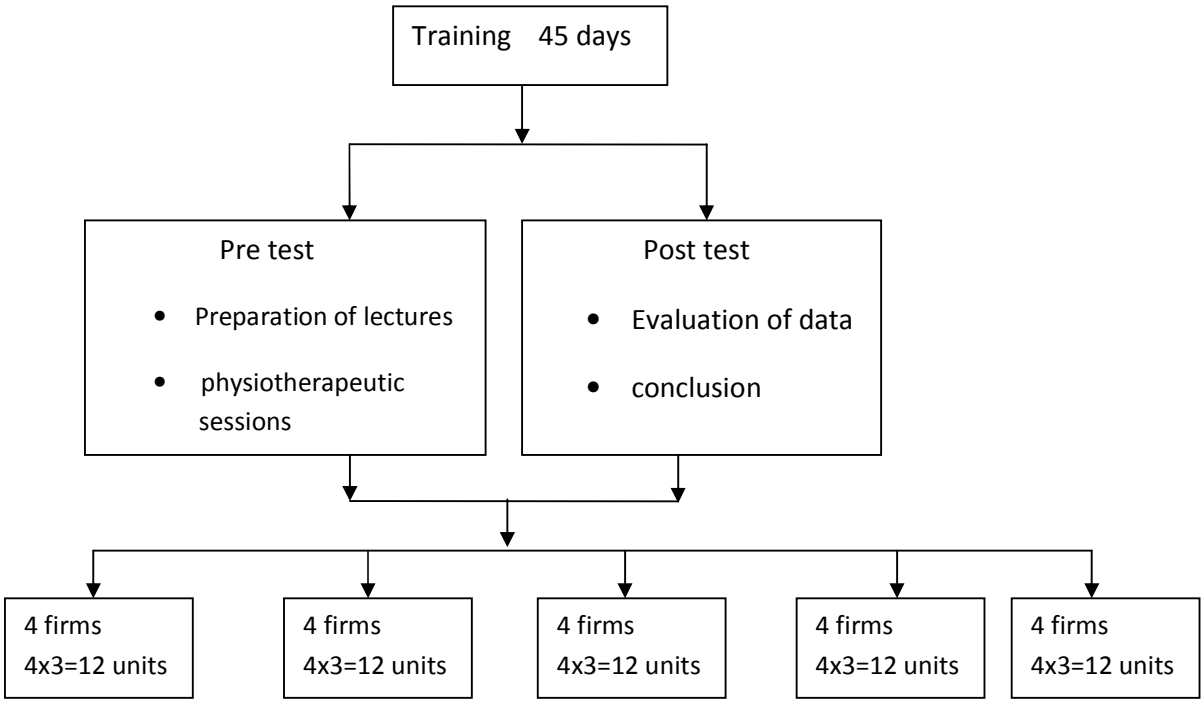
Phase 2:

- Identify various musculoskeletal and occupational health problems amongst the workers.
- Provide ergonomics intervention program for improvement in occupational health and productivity of the unit and analyze the paired t-test.

The duration of the training will be of 45 days.

20 firms (20 x 3 = 60 units)

Phase2

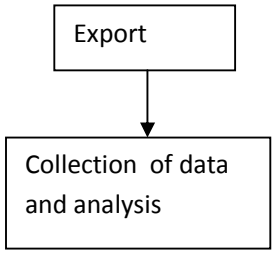


Pictorial presentation for training

Phase 3:

- Study the changes that have occurred in export in last fifty years.
  To study the changes related to export data will be collected from CEPC for last fifty years to get the complete knowledge of growth of carpets in export industry.

Phase 3



Pictorial presentation for export

Analysis of data

For the analysis of data following steps will be taken-

a) Coding method- The data from interview schedule will be transferred to coding sheet by assigning numerals to responses. This facilitates tabulation and analysis of data.
b) Tabulation method- after the data transferred to coding sheet, tabulation will done. The data will be transferred in the form of tables.
c) Analysis- Collected data will be analyzed to express the complex and scattered information into simple clear and logical data in form of frequency and percentage. Graphs will be prepared to show changes in last 50 years. Data regarding health hazards will be shown through graphs and percentage charts.

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14	igys vkSj orZeku esa dkWjisV dh fuekZ.k esa D;k cnyko vk;k gSA DokfyVh fMtkbZu तकनीक
15	dHkh dksbZ Vªsfuax@lVhZfQdsV कोर्स fd;k gSA
16	ljdkjh ;kstukvksa ,oa dk;Zdzeksa dh tkudkjh gS हाँ ughaA

17	bl dk;Z dks ljdkj ls D;k vis{kk,sa gSA ljdkjh laj{k.k dh vko';drk gS ;k ughaA
18	D;k mUgs i;kZIr Vªsfuax nsrs gSa \ हाँ ughaA
19	fdrus eki ds dkWisZV T;knk curs g Sa\ 3x5 sq.ft 5x10 sq.ft 9x12 sq.ft 10x14 sq.ft 12x15 sq.ft
20	fdrus तरह ds dkWisZV T;knk curs gS a\ कॉटन ऊनि सिल्क अन्य
21	एक dkWisZV को rS;kj gksus esa fdruk le; yxrk gS a\ 3x5 sq.ft 5x10 sq.ft 9x12 sq.ft 10x14 sq.ft 12x15 sq.ft
22	bldh D;k ykxr vkrh gS\
23	dkSu ls रंग Lrseky djrs gSa\ dc ls\
24	dkSu ls /kkxk Lrseky djrs gSa\ dc ls\
25	कितने प्लाई का धागा इस्तेमाल करते हैं

	2 प्लाई 3 प्लाई 8 प्लाई
26	daiuh dk D;k VuZ vksoj gS\
27	fMtkbZu dkSu cukrk gS\ % esa ? vki dLVej nsrk gS
28	fdrus cqudj bu fMikVZesaUV esa dke djrs gS& eSU;qQsDpfjax fQfuf'kax okWf'kax
29	D;k rdyhQsa vkrh gS cqudjksa ls lEcU/khr \
30	dksbZ xSj ljdkjh laLFkk tks bl dyk ds laj{k.k gsrq dk;Z dj jgh gS \
31	आपकी कम्पनी का साल का क्या टर्नओवर है **5 -10** करोड़ **11 -20** करोड़ **21 -30** करोड़ **30 -50** करोड़ **50** करोड़ से ज़्यादा